The European Society of Regional Anaesthesia & Pain Therapy
ESRA ITALIA

ESRA ITALIAN CHAPTER

30° NATIONAL MEETING

13-15 NOV 2025

NAPOLI
HOTEL RAMADA

Presidents:
Giuseppe Servillo, Fabrizio Fattorini

MZ EVENTS

Università degli Studi della Campania Luigi Vanvitelli

Azienda Ospedaliera Universitaria Luigi Vanvitelli

When things don't go as planned: what then?

UOC Anestesia e Rianimazione
Dir. Prof.ssa Caterina Pace
UOSD Terapia Intensiva
Dir.: Prof. Fausto Ferraro

Dott. Massimo Ciaravola

Epidemiology

Regional anesthesia carries a low absolute risk of major complications; selected illustrative estimates:

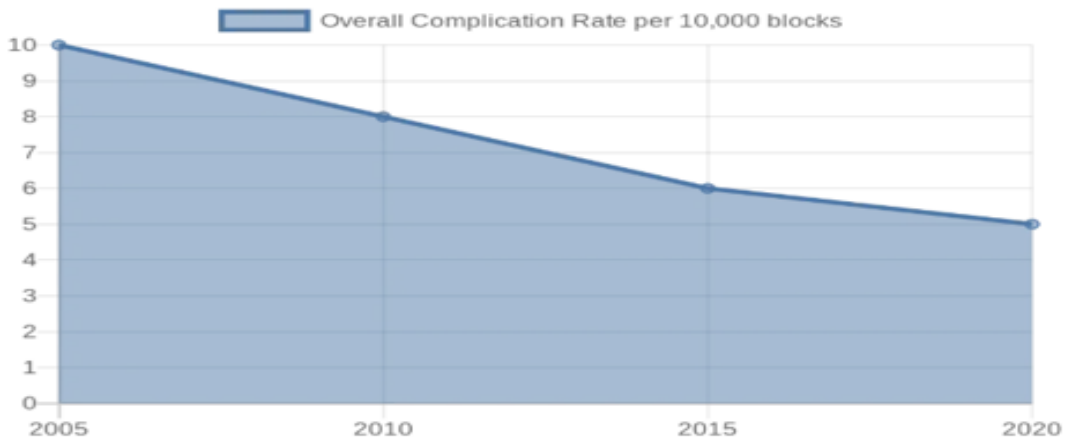
- Transient neurologic symptoms: ~0.3–1.2%
- Permanent severe nerve injury: ~0.02–0.04% (2–4 per 10,000)
- Pneumothorax (older series): 0.2–3% (technique-dependent)
- Epidural abscess: rare — variable by population (1:2,000 to 1:50,000)

Epidemiology snapshot

Low absolute risk

Rare events have high clinical impact — preparedness is essential.

- Regional anesthesia (RA) is an essential, generally safe technique for perioperative analgesia.
- Rare, but potentially severe complications span systemic, neurologic, cardiovascular, infectious and mechanical domains.
- This talk focuses on incidence, risk factors, prevention and immediate management.



Regional Anaesthesia: Risk, Consent and Complications.McCombe K, Bogod D. Anaesthesia. 2021;76 Suppl 1:18-26. doi:10.1111/anae.15246.

Classification of Complications

Systemic
(LAST)

Neurologic
(nerve injury, TNS)

Cardiovascular
(hypotension, arrest)

Infectious

Mechanical
(pneumothorax, hematoma)

Mechanisms of Injury

- Direct mechanical trauma (needle or catheter contact)
- Ischemic injury due to vascular compromise or compression
- Neurotoxicity from high local anesthetic concentration
- Systemic toxicity following intravascular injection (LAST)
- Infectious seeding associated with indwelling catheters

Local Anesthetic Systemic Toxicity (LAST)

LAST results from toxic systemic concentrations — early CNS signs (peri-oral numbness, tinnitus) may precede seizures and cardiovascular collapse. Rapid recognition and lipid emulsion therapy are essential.

- Prevention: incremental dosing, aspiration, ultrasound guidance, dose calculation by weight.
- Treatment: airway, seizure control, advanced cardiac life support and 20% lipid emulsion.

LAST: rare

See StatPearls 2022; Neal et al., RAPM 2018

LAST — Trend (illustrative)

Illustrative trend: incidence appears lower in modern ultrasound-guided series.

StatPearls 2022; Arumugam et al. 2020

Neurologic Complications

Transient neuropathies after peripheral nerve block are relatively uncommon; permanent severe injury is rare but clinically important.

- Transient neuropathy ~2% at 3 months in some series; permanent deficits ~2–4 per 10,000 blocks.
- Prevention: ultrasound guidance, careful needle handling, avoid intraneural injection.

Numbers

2–4 / 10,000
(permanent severe injury estimate)

Neurologic Complications — Deep Dive

- Mechanisms: direct trauma, intraneural injection, ischemia, neurotoxicity.
- Transient neuropathies are more common; permanent deficits are rare (~2–4/10,000).
- Early MRI and neurology referral if progressive deficits occur.

Clinical practice points

- Ultrasound visualization
- Limit injection pressure
- Baseline neurologic documentation

Bais K. Nerve injury following regional nerve block, 2024

Cardiovascular Complications

Neuraxial blocks commonly cause hypotension and bradycardia; severe events (including cardiac arrest) are rare but reported.

- Manage with fluids, vasopressors, and advanced life support if needed.

Typical immediate measures

IV fluids · Vasopressors · Atropine

Cardiovascular & Respiratory Effects — Timeline

Neuraxial sympathetic blockade commonly causes hypotension; LAST may provoke arrhythmias and cardiac depression. Rapid progression can occur within minutes.

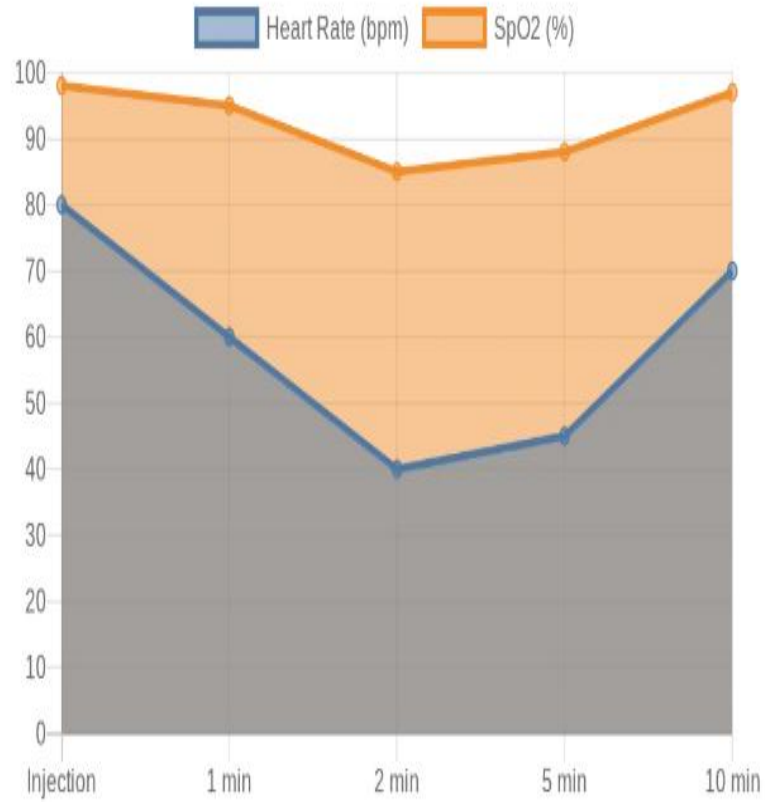
1. Seconds–minutes: CNS manifestations, hypotension
2. Minutes: seizures, arrhythmias
3. Minutes–hours: cardiac collapse without intervention

Immediate actions

- Airway & ventilation
- IV fluids & vasopressors
- Prepare lipid emulsion and ACLS

Regional Anesthesia Complications and Contraindications. Shams D, Sachse K, Statzer N, Gupta RK. Clinics in Sports Medicine. 2022;41(2):329-343. doi:10.1016/j.csm.2021.11.006.

Cardiovascular & Respiratory Effects



Neal JM et al., Regional Anesthesia and Pain Medicine, 2018

Infectious Complications

Epidural abscess and meningitis after neuraxial techniques are rare but have high morbidity; incidence estimates vary by population and catheter duration.

- Epidural abscess: rare — estimates range from ~1:2,000 to much lower in obstetric practice.
- Prevention: strict asepsis, limit catheter dwell time, high suspicion for fever/back pain.

~0.0005–0.00002

(approx. range: 1:2,000 to 1:50,000 in selected series)

Mechanical Complications

Pneumothorax is a recognized complication of supraclavicular/interscalene blocks. Incidence depends on technique and guidance.

- Reported rates for pneumothorax range from ~0.2% to 3% in older neurostimulation-era series; ultrasound reduces but does not eliminate risk.

0.2%–3%

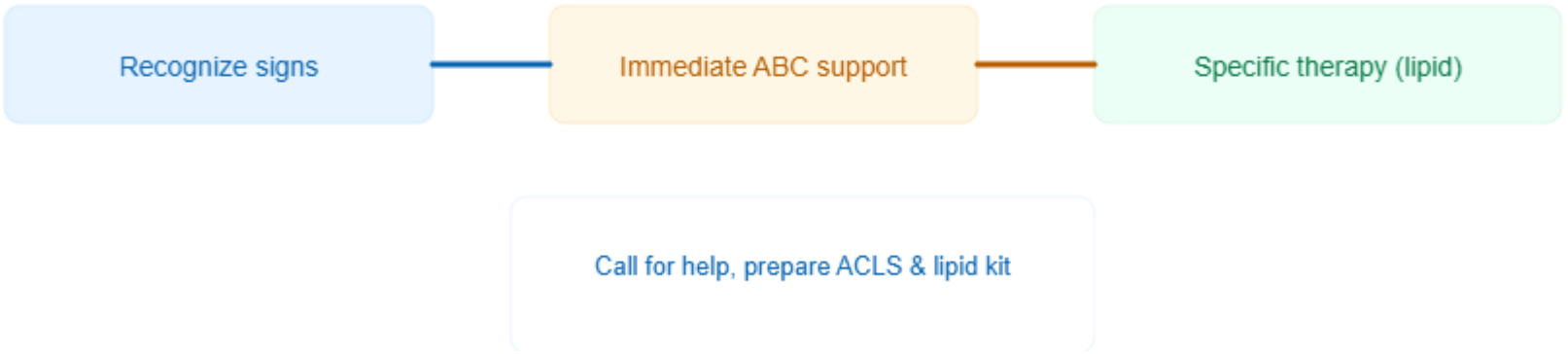
(older series; technique-dependent)

Complications and Adverse Effects Associated With Continuous Peripheral Nerve Blocks in Orthopedic Patients. Wiegel M,Gottschaldt U, Hennebach R, Hirschberg T, Reske A.Anesthesia and Analgesia. 2007;104(6):1578-82, table of contents.

Bowden BD et al., pneumothorax case series, 2020

Immediate Management — Practical Steps

1. Recognize early signs (CNS, cardiovascular, respiratory).
2. Support airway, breathing, circulation; stop local anesthetic infusion.
3. Administer lipid emulsion for LAST; follow ACLS if cardiac arrest.
4. Infectious suspicion → imaging & early antibiotics; consider surgical drainage for abscess.



Postoperative monitoring

Intraoperative complications

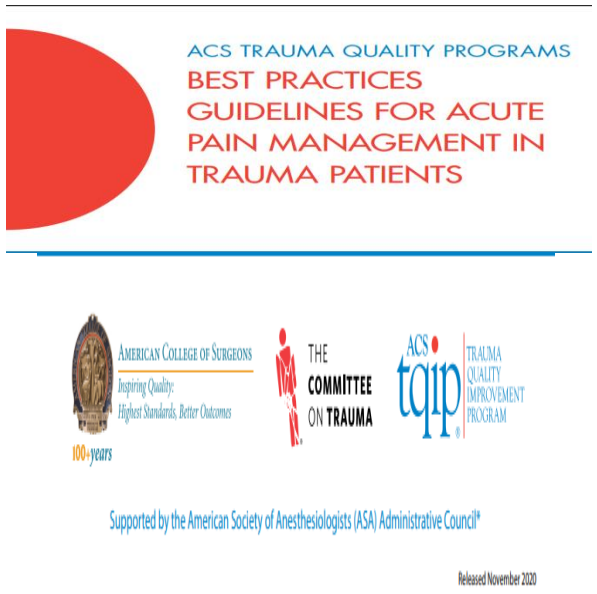
management of analgesia in the ICU

Critical care innovations: navigating pain relief in intensive care: the role of regional anesthesia

Campbell, Amber; Jacoby, Mackenzie; Hernandez, Nadia

Author Information

Current Opinion in Anaesthesiology 37(5):p 547-552, October 2024. | **DOI:** 10.1097/ACO.0000000000001422



Reg Anesth Pain Med. 2012 Sep-Oct;37(5):537-44. doi: 10.1097/AAP.0b013e3182625f1a.

Regional anesthesia and analgesia in critically ill patients: a systematic review

Ottokar Stundner [1], Stavros G Memtsoudis

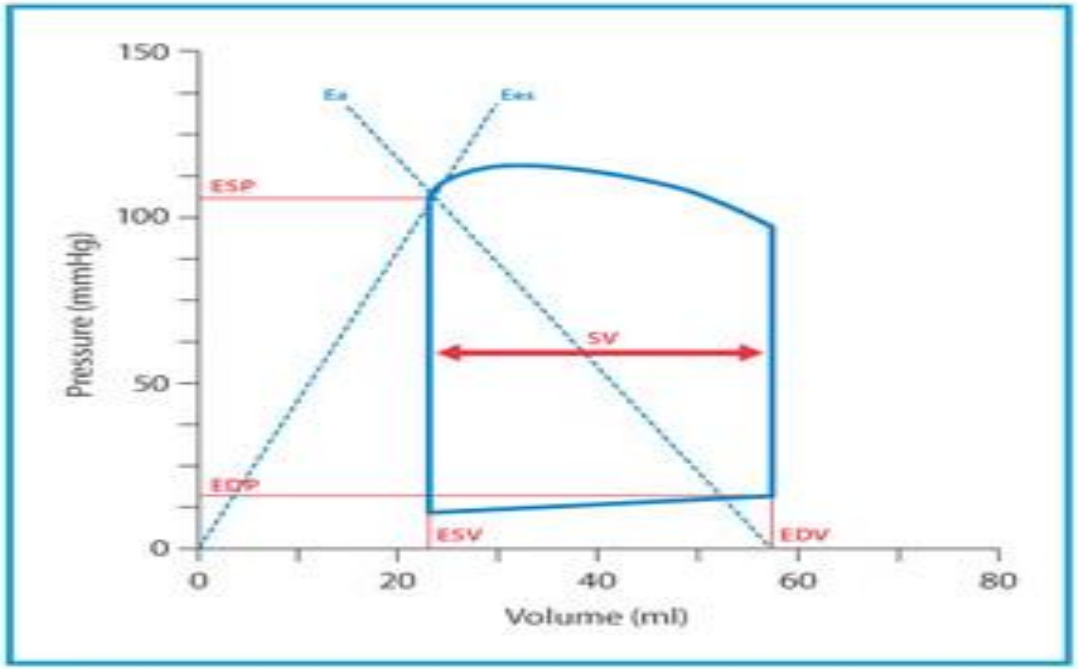


Table 1. Measurement of the parameters derived from a pressure-volume loop of the left ventricle

End-systolic pressure (ESP) = systolic blood pressure x 0.9
Arterial elastance (Ea) = ESP/stroke volume
End-systolic LV elastance (Ees) = ESP/end-systolic volume
End-diastolic LV elastance (Eed) = EDP/end-diastolic volume
Ventricular-arterial coupling (VAC) = Ea/Ees
Stoke work (SW) = ESP x SV
Potential energy (PE) = ESP x ESV/2
Pressure-volume area (PVA) = PE + SW
LV work efficiency = 100 x SW/PVA

Ventricular-arterial coupling in heart failure. Department of Cardiac, Thoracic, Vascular Sciences and Public Health, University of Padua, Italy;
Received 10 June 2019; accepted 23 July 2019

REVIEW ARTICLE | Originally Published 16 March 2023 |
Check for updates

Evaluation and Management of Pulmonary Hypertension in Noncardiac Surgery: A Scientific Statement From the American Heart Association

Sudarshan Rajagopal, MD, PhD, FAHA, Vice Chair, Kurt Ruetzler, MD, PhD, FAHA, Chair, Kamrouz Ghadimi, MD, MHS, FAHA, Evelyn M. Horn, MD, Marta Kelava, MD, Kristina T. Kudelko, MD, Ingrid Moreno-Duarte, MD, Ioana Preston, MD, Leonie L. Rose Bovino, PhD, APRN, AGACNP-BC, FAHA, Nathaniel R. Smilowitz, MD, MS, and Anjali Vaidya, MD on behalf of the American Heart Association Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation, and the Council on Cardiovascular and Stroke Nursing | AUTHOR INFO & AFFILIATIONS

Circulation • Volume 147, Number 17 • https://doi.org/10.1161/CIR.0000000000001136

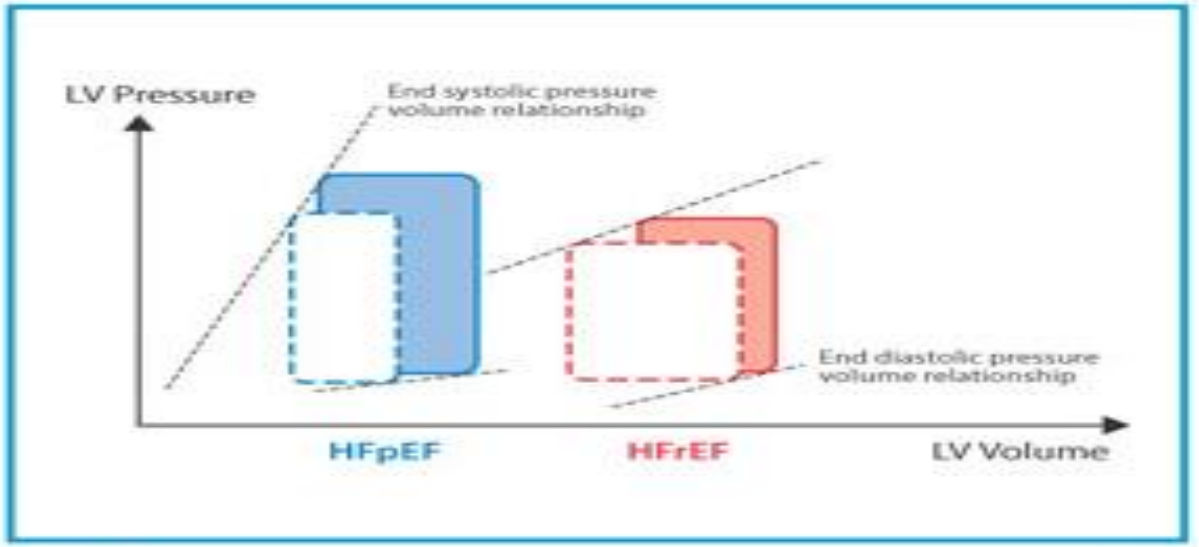
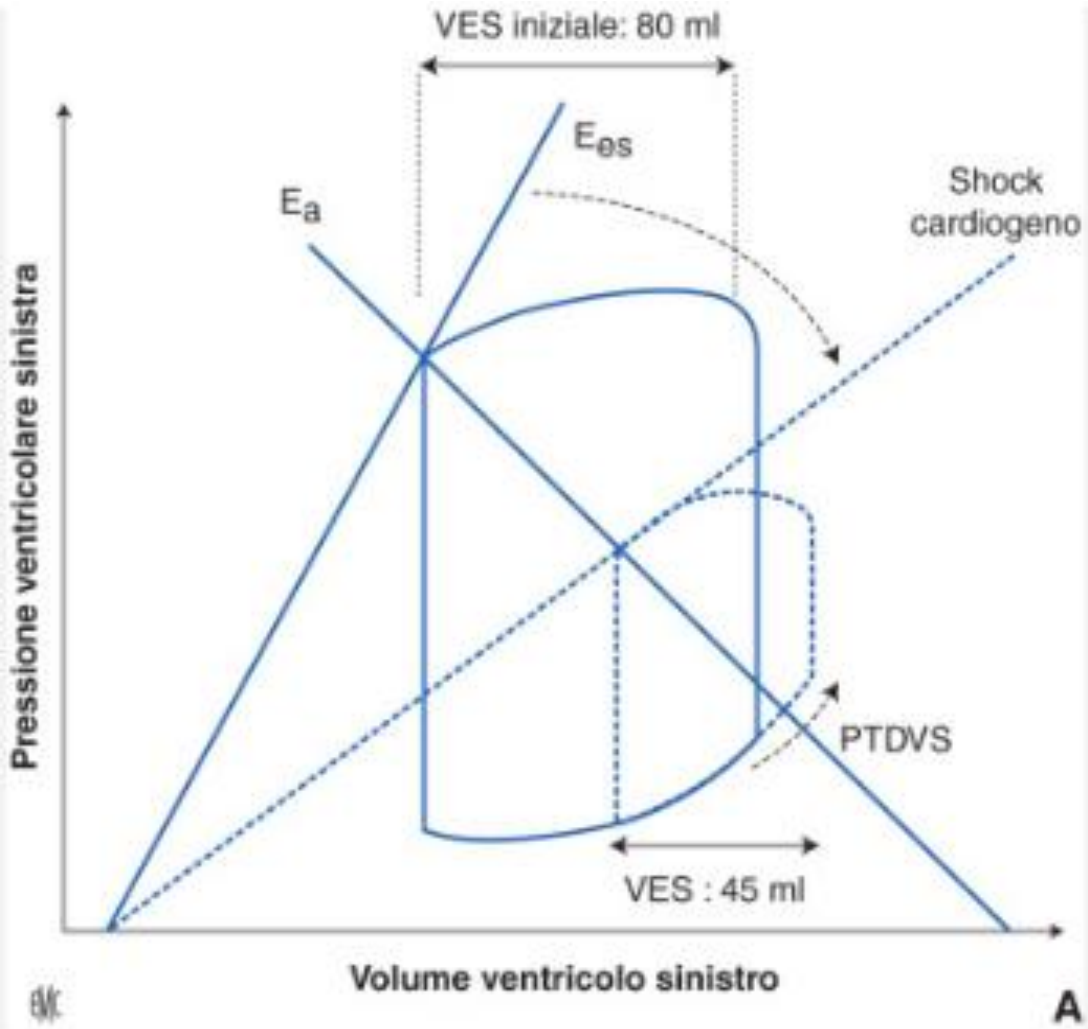
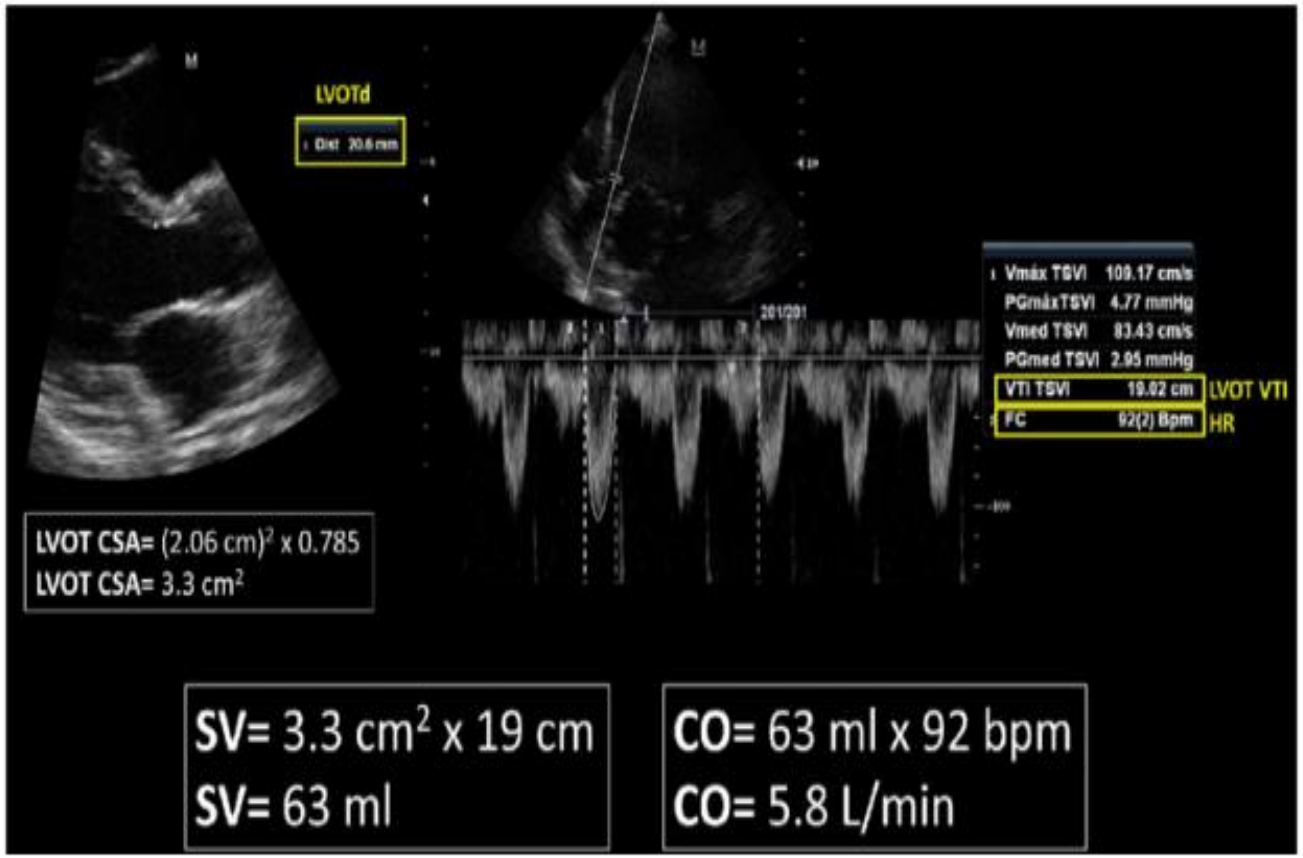
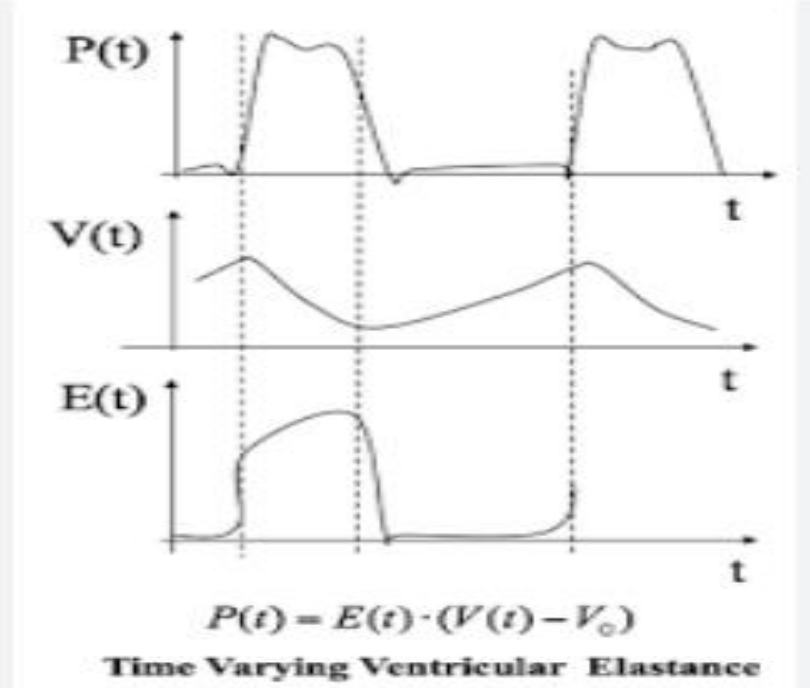


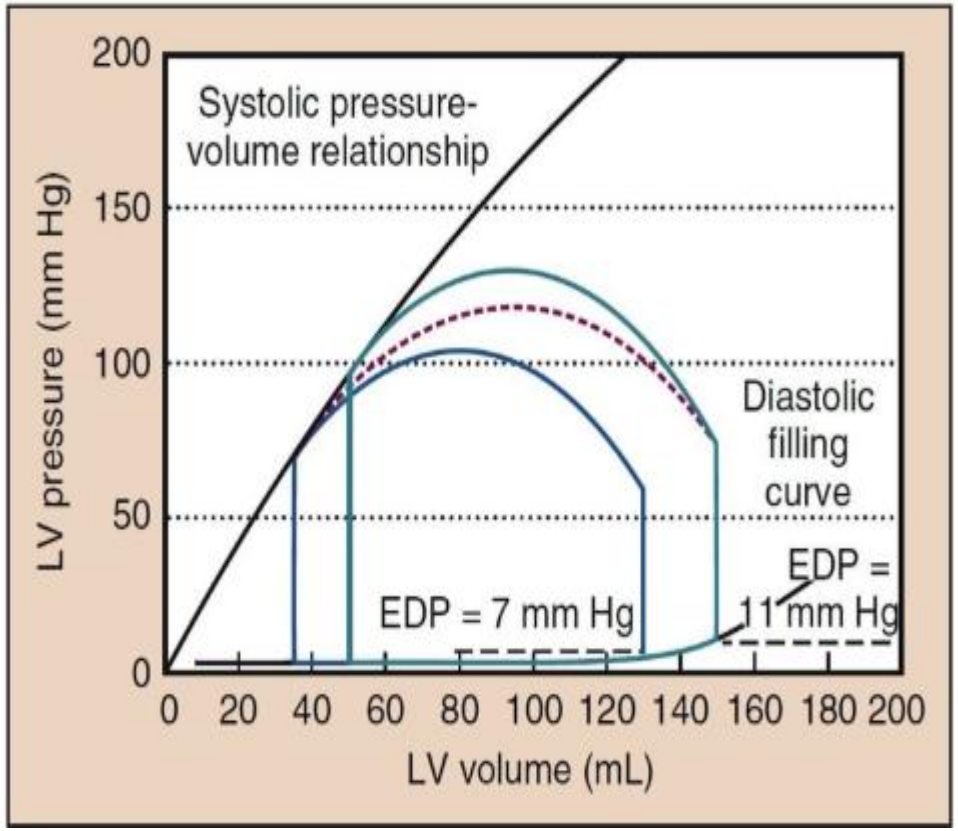
Figure 2. In the heart failure with preserved ejection fraction, both arterial elastance (Ea) and end-systolic ventricular elastance (Ees) increase, resulting in a normal ventricular-arterial coupling value.





Calculation of the stroke volume (SV) and cardiac output (CO) by transthoracic echocardiography in a critically ill patient without hemodynamic compromise. LVOT: left ventricular outflow tract; d: diameter; CSA: cross-sectional area; VTI: velocity-time integral; HR: heart rate



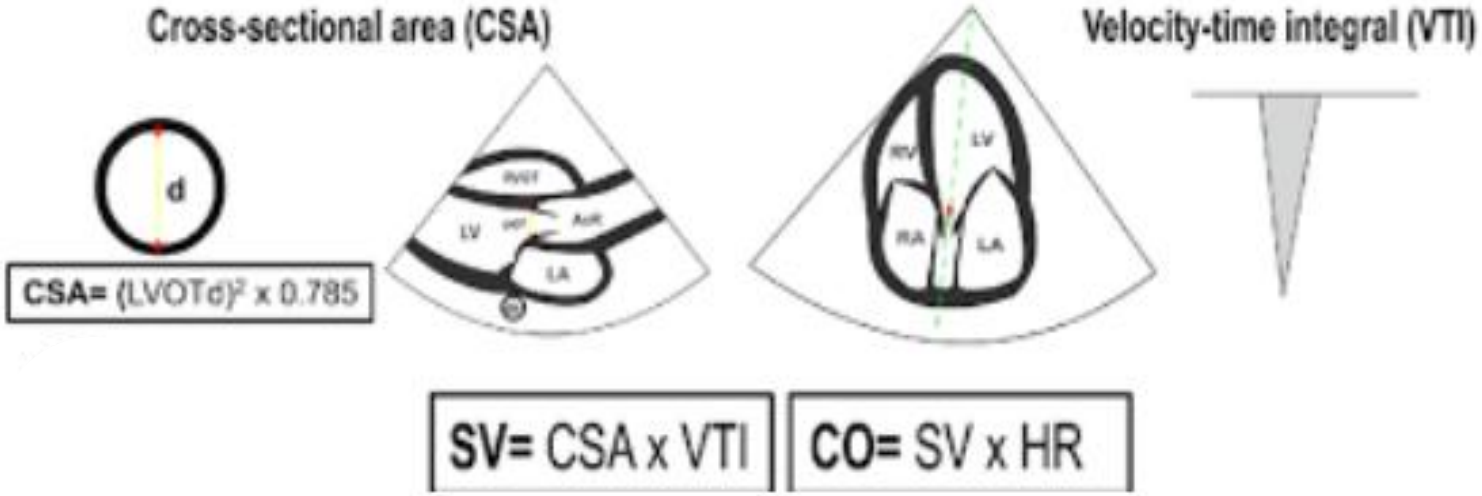


Effect of thoracic epidural anesthesia on right ventricular function and homeometric autoreg
Paul Steendijk
Crit Care 2007 Jan;35(1):321-2. doi: 10.1097/01.CCM.0000251631.45964.20.

Evaluation and Management of Pulmonary Hypertension in Noncardiac Surgery: A Scientific Statement From the American Heart Association.Rajagopal S, Ruetzler K, Ghadimi K, et al.
Circulation. 2023;147(17):1317-1343. doi:10.1161/CIR.0000000000001136.

Thoracic Epidural Anesthesia Reduces Right Ventricular Systolic Function With Maintained Ventricular-Pulmonary Coupling.Wink J, de Wilde RB, Wouters PF, et al.Circulation. 2016;134(16):1163-1175. doi:10.1161/CIRCULATIONAHA.116.022415.

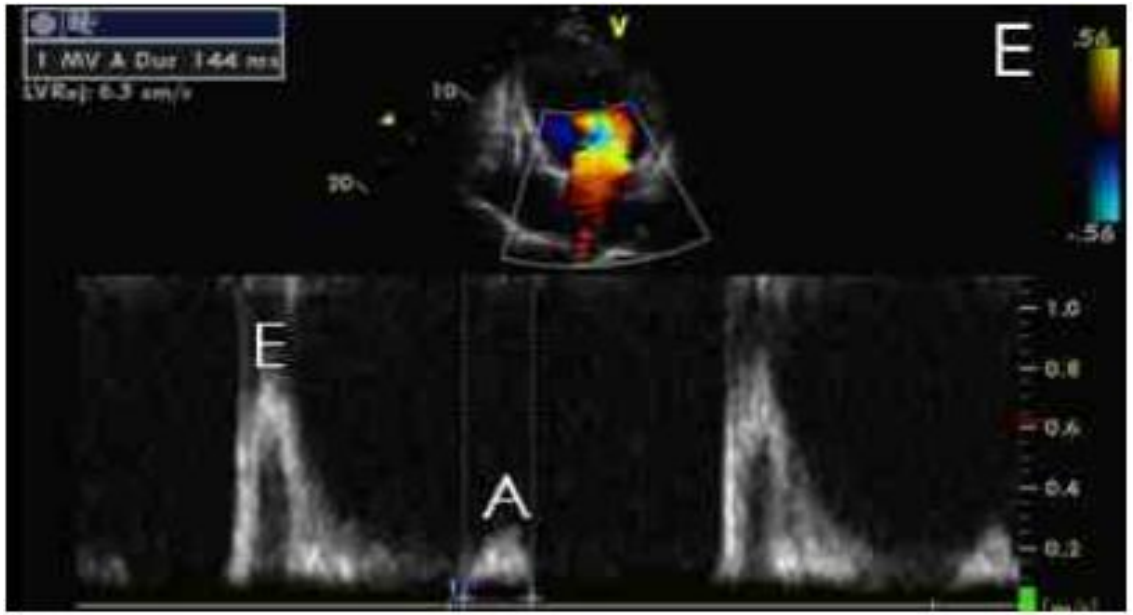
Reduction of myocardial contractility after locoregional anesthesia is mediated by both direct myocardial depressant effects of local anesthetics and, in the case of neuraxial techniques, by sympathetic blockade. These effects are generally reversible and dose-dependent, but can be clinically significant in the context of toxicity or in patients with limited cardiac reserve.



Myocardial accumulation of bupivacaine and ropivacaine is associated with reversible effects on mitochondria and reduced myocardial funct
Nicole Hiller[1], Peter Mirtschink, Christine Merkel, Lilla Knels, Reinhard Oertel, Torsten Christ, Andreas Deussen, Thea Koch, Sebastian N Stehr
PMID: 23223114 DOI: 10.1213/ANE.0b013e31826c8095

Comparative Effect of Lidocaine, Bupivacaine and RAC 109 on Myocardial Conduction and Contractility in the Rabbit.Kariya N, Cosson C, Mazoit JX.
European Journal of Pharmacology. 2012;691(1-3):110-7. doi:10.1016/j.ejphar.2012.05.034.

Antiarrhythmic Mechanisms of Epidural Blockade After Myocardial Infarction.Hoang JD, van Weperen VYH, Kang KW, et al.
Circulation Research. 2024;135(3):e57-e75. doi:10.1161/CIRCRESAHA.123.324058.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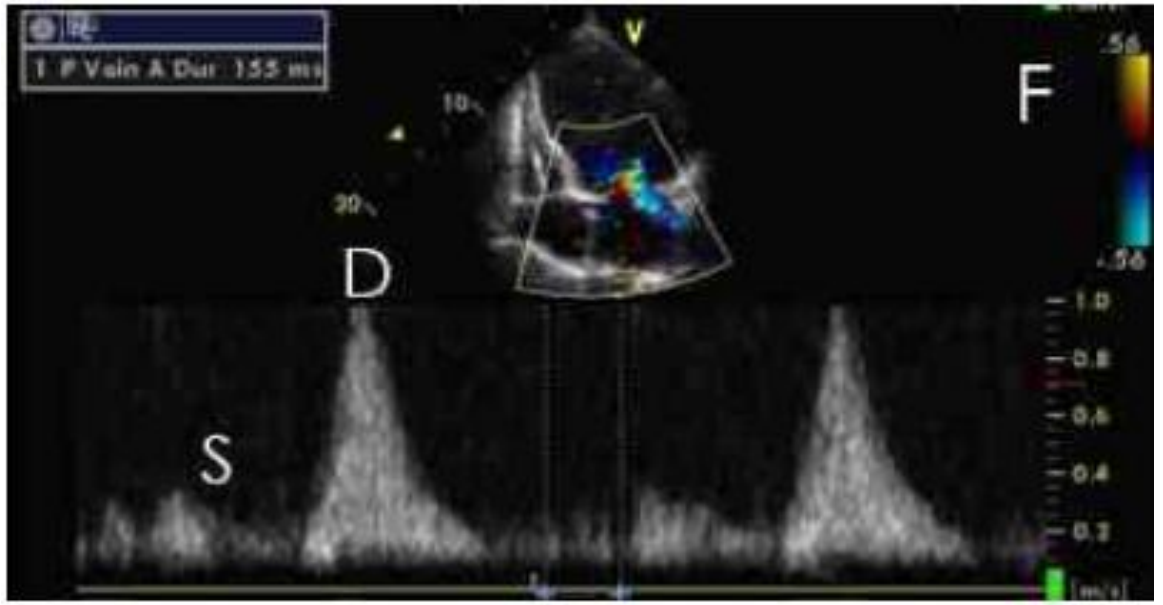
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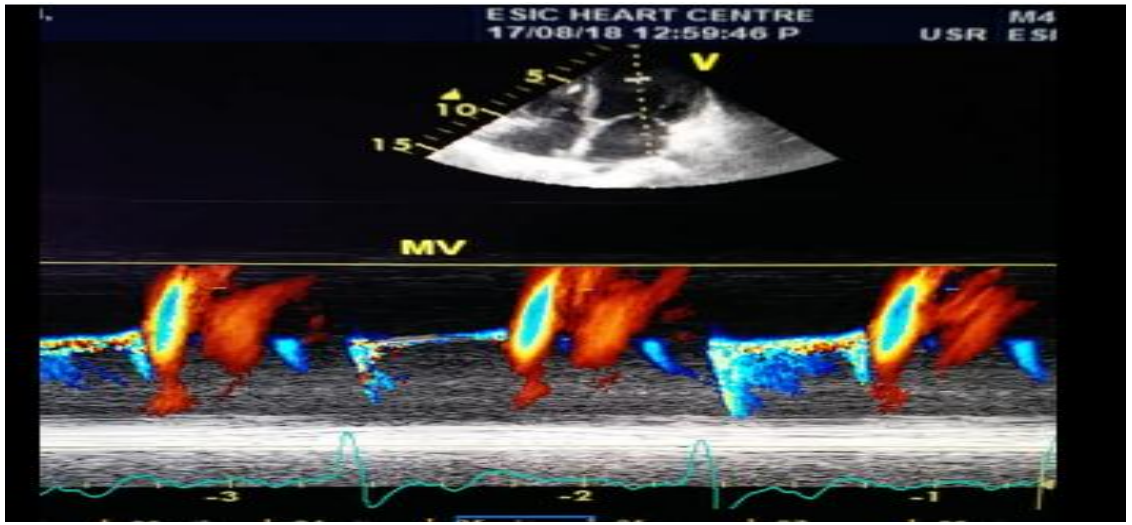
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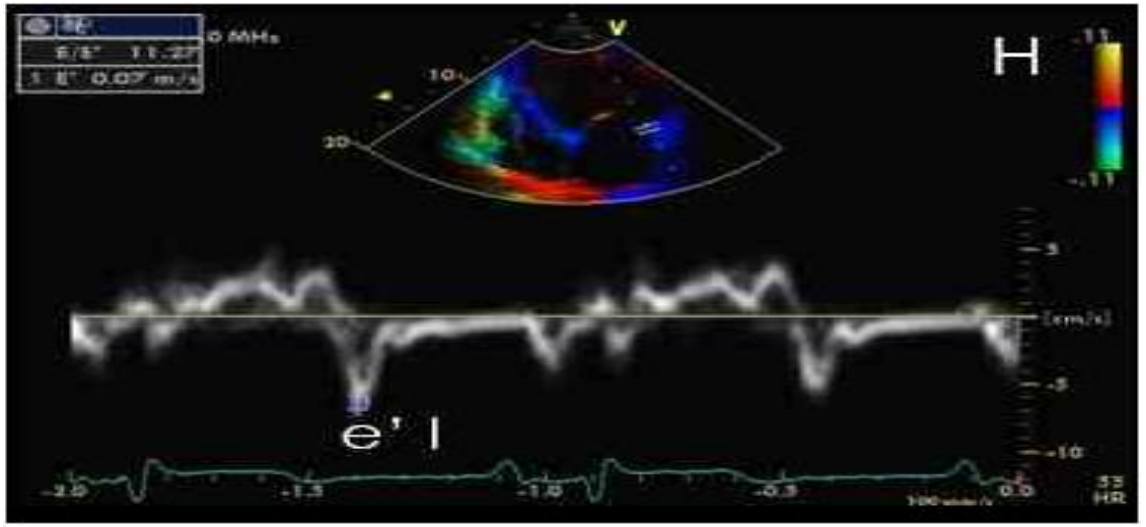
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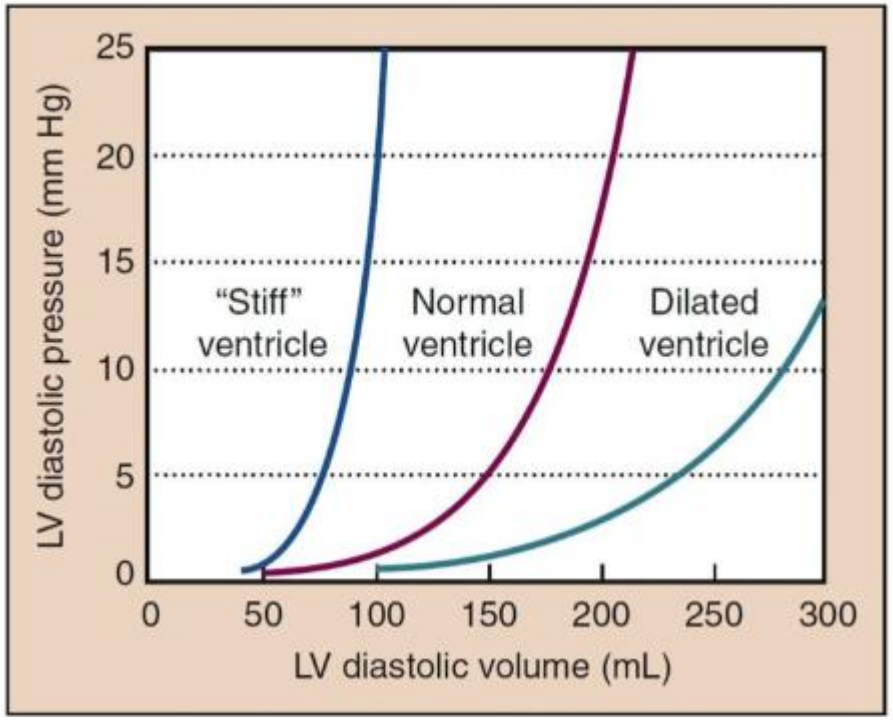
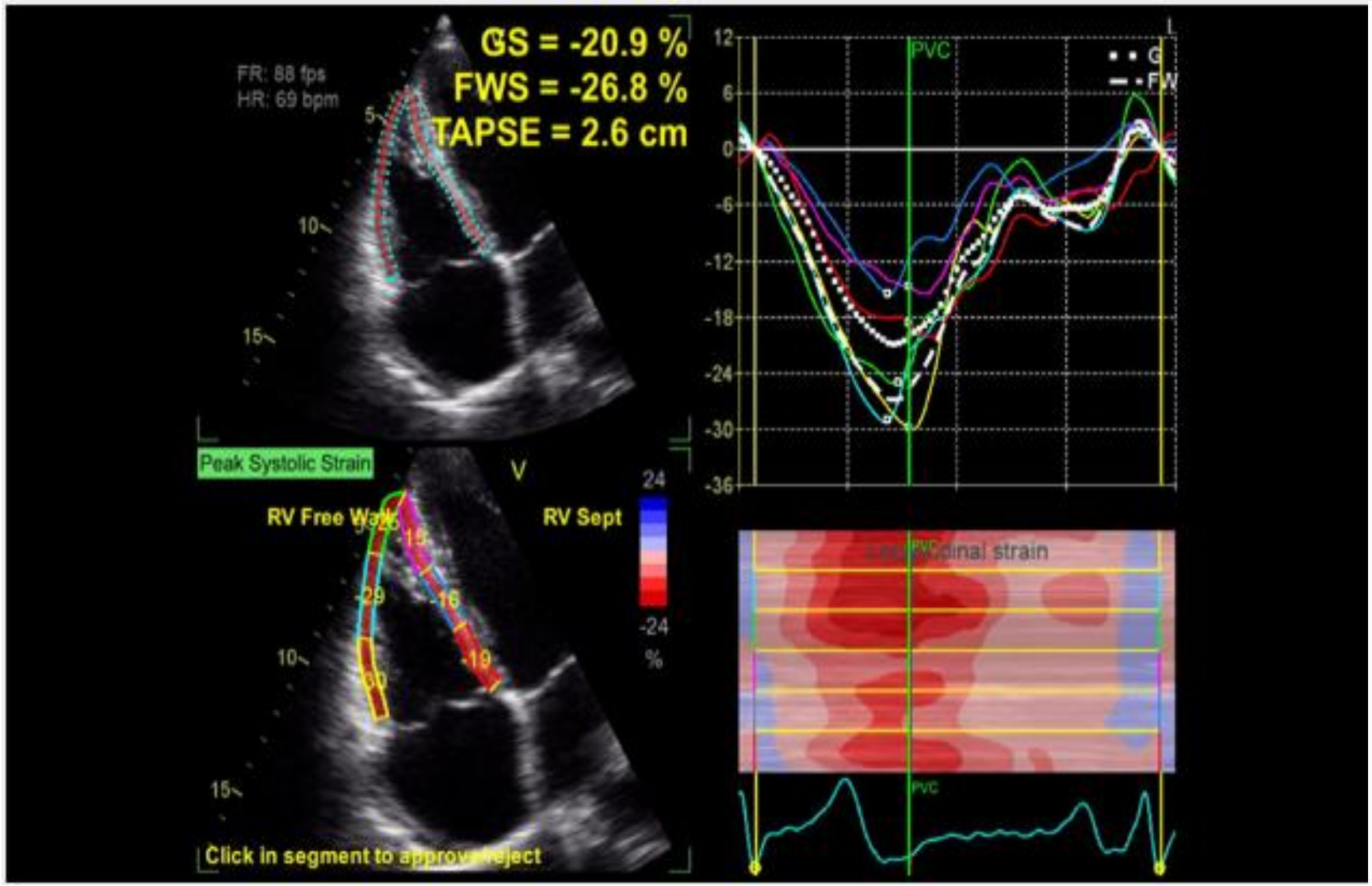
Locoregional anesthesia alters the diastolic phase by decreasing cardiac filling volumes and left ventricular end-diastolic diameter due to reduced venous return and preload.



Reduced Left Ventricular Diameters at Onset of Bradycardia During Epidural Anaesthesia.Jacobsen J, Søfelt S, Brocks V, et al.
Acta Anaesthesiologica Scandinavica. 1992;36(8):831-6. doi:10.1111/j.1399-6576.1992.tb03573.x.
Comparison of the Hemodynamic Effects of a Single 5 Mg/Kg Dose of Lidocaine With or Without Epinephrine for Thoracic Paravertebral Block.Garutti I, Olmedilla L, Cruz P, et al.
Regional Anesthesia and Pain Medicine. 2008 Jan-Feb;33(1):57-63. doi:10.1016/j.rapm.2007.07.009.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TAPSE = 2.6 cm
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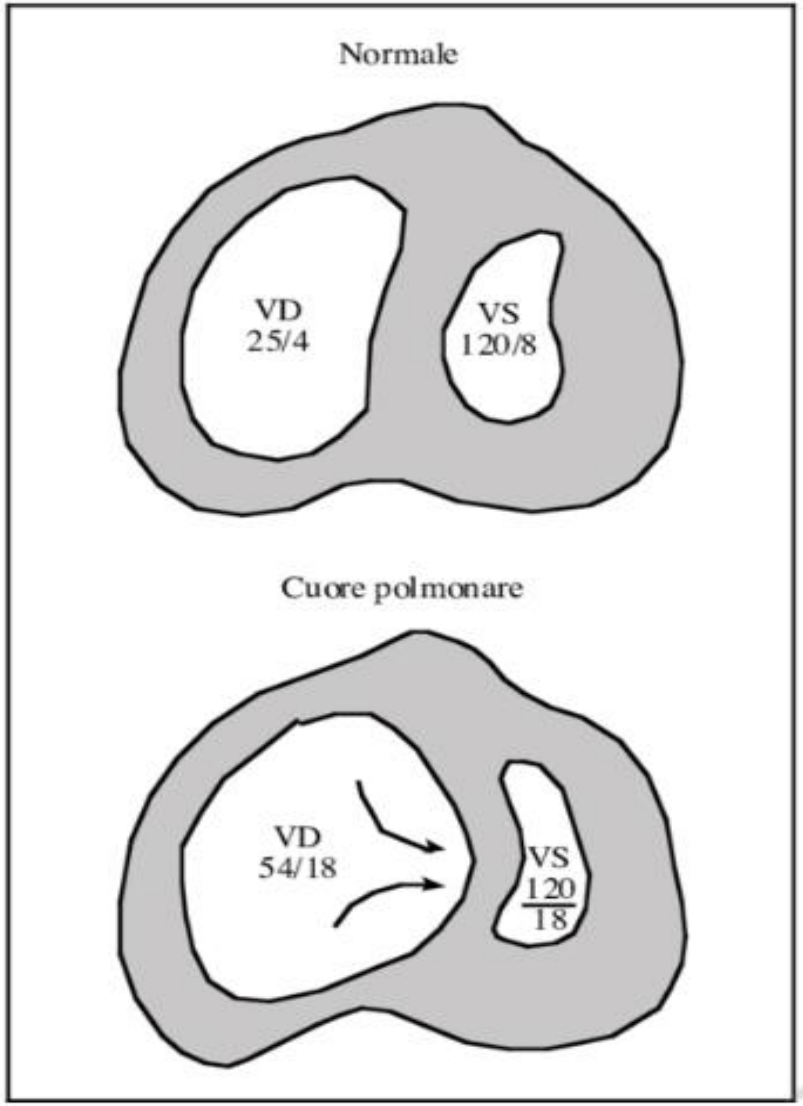
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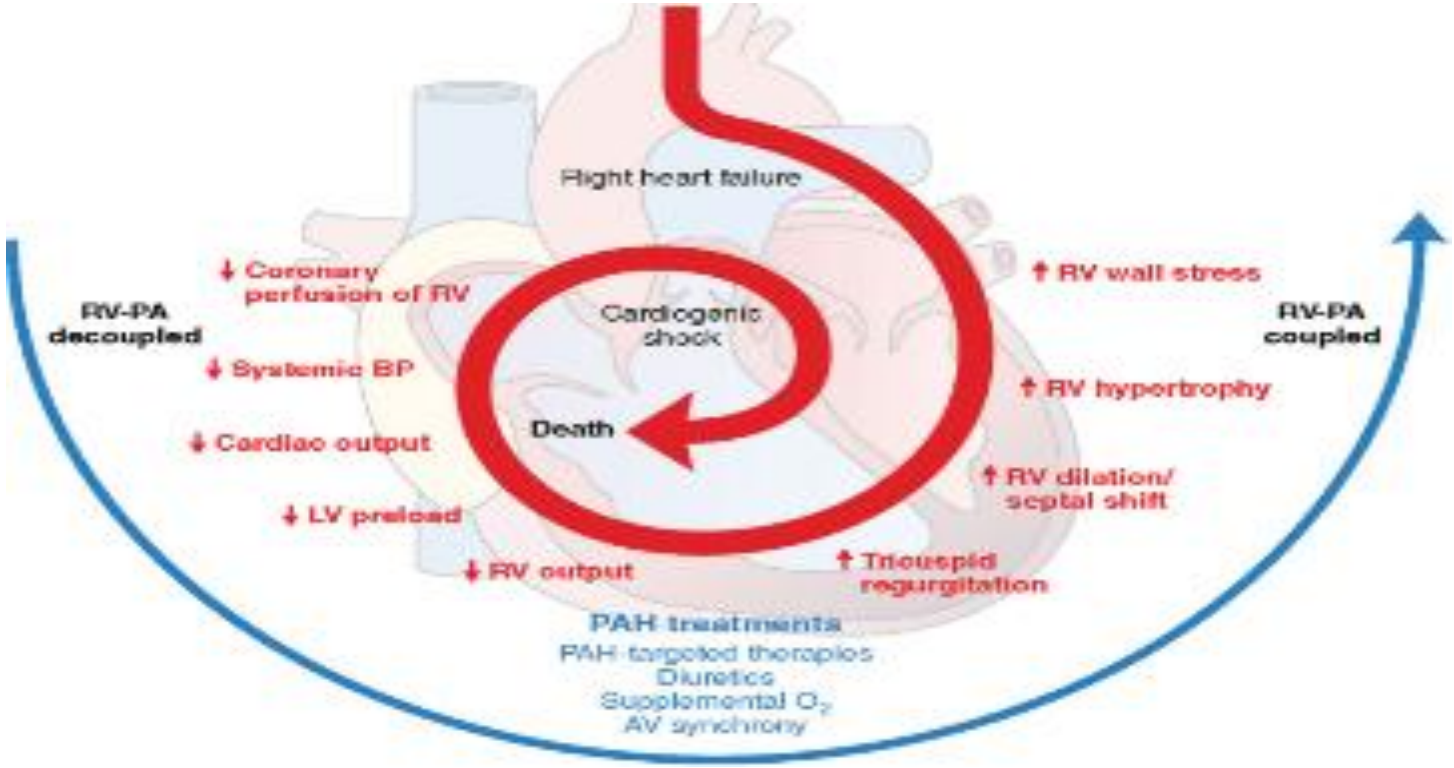
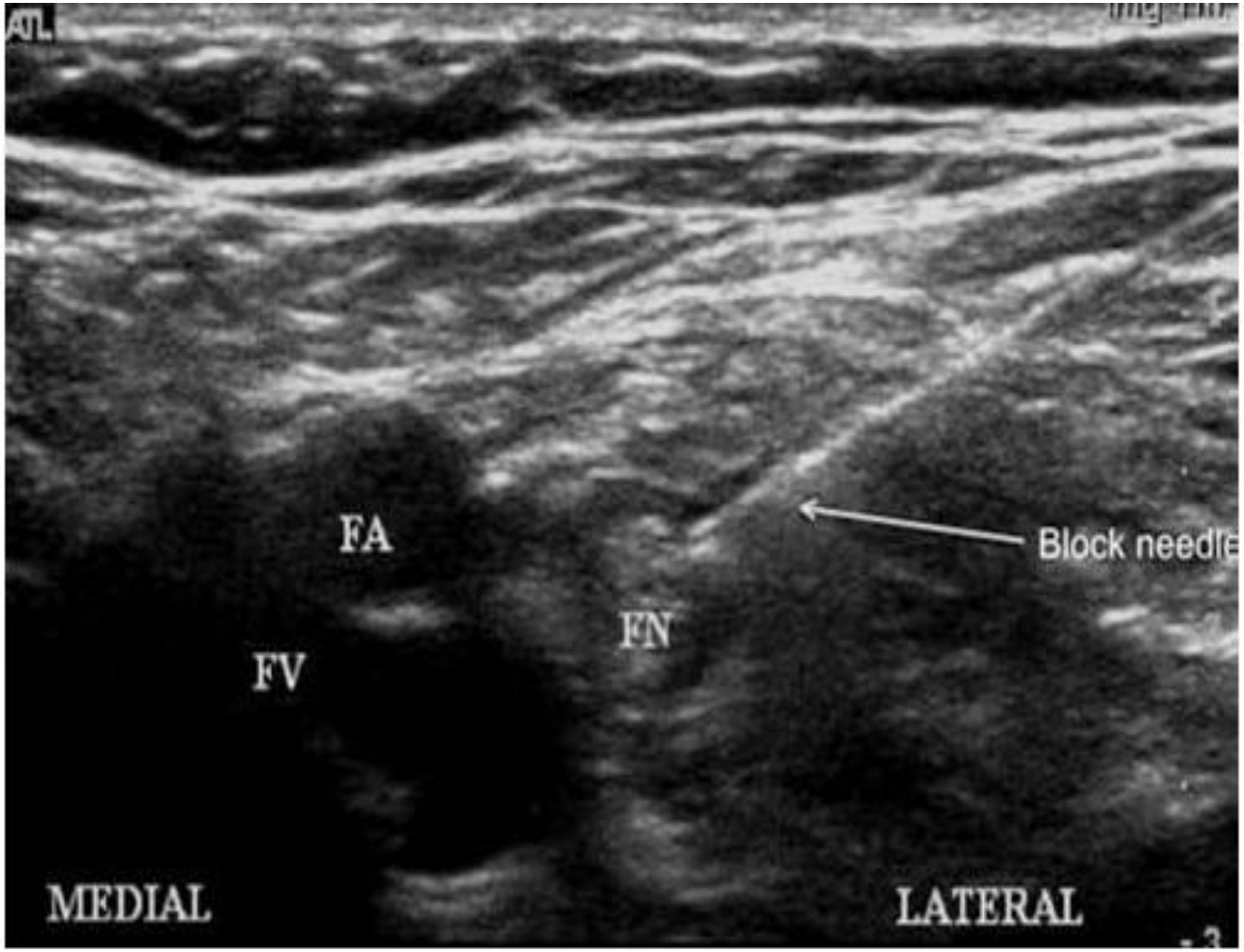
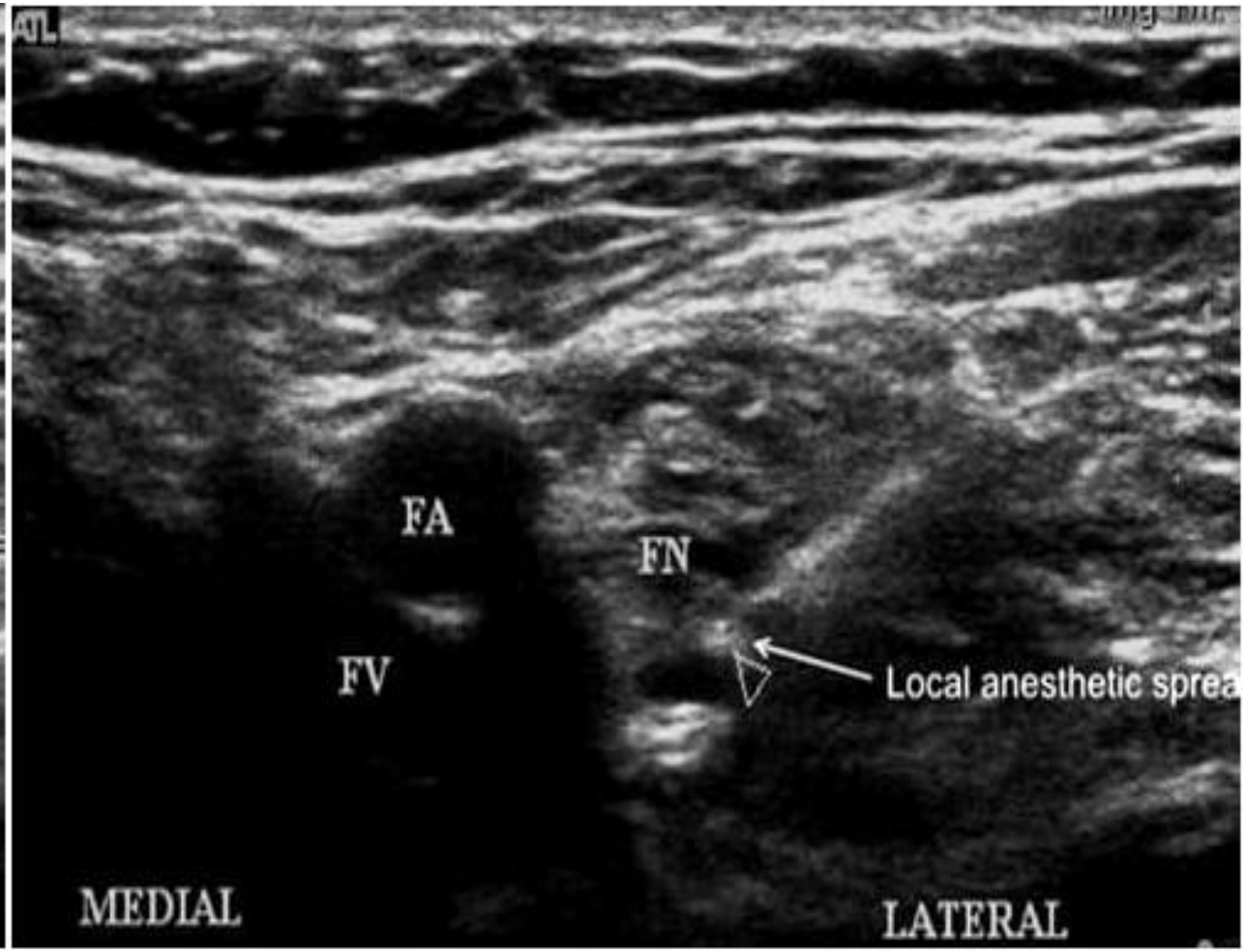
The clinical consequences of RV overload include impaired left ventricular filling due to ventricular interdependence, reduced cardiac output, and potential hemodynamic instability.



The Impact of Spinal Anesthesia on Cardiac Function in Euvolemic Vascular Surgery Patients: Insights From Echocardiography and Biomarkers.Gkounti G, Loutradis C, Tzimou M, et al. The International Journal of Cardiovascular Imaging. 2024;40(11):2305-2315. doi:10.1007/s10554-024-03228-2.
Right Ventricular Perfusion: Physiology and Clinical Implications.Crystal GJ, Pagel PS. Anesthesiology. 2018;128(1):202-218. doi:10.1097/ALN.0000000000001891.





Peripheral Regional Anaesthesia and Outcome: Lessons Learned From the Last 10 Years.Kessler J, Marhofer P, Hopkins PM, Hollmann MW.
British Journal of Anaesthesia. 2015;114(5):728-45. doi:10.1093/bja/aeu559.

Respiratory Complications in Regional Anesthesia

Type of Block	Respiratory Complication	Pathophysiological Mechanism	Prevention / Management
High spinal / thoracic epidural anesthesia	Respiratory depression, apnea	Excessive cephalad spread of local anesthetic causing phrenic nerve (C3–C5) block or inhibition of the medullary respiratory center	Use appropriate doses; monitor sensory level; semi-sitting position; ventilatory support if needed
	Hypotension and bradycardia with dyspnea	Extensive sympathetic block → decreased venous return and cerebral perfusion	IV fluids, vasopressors (e.g., ephedrine), reassurance
Interscalene brachial plexus block	Phrenic nerve palsy (elevated hemidiaphragm)	Local anesthetic diffusion toward C3–C5 roots	Avoid in respiratory-compromised patients; reduce volume; ultrasound guidance
	Pneumothorax	Accidental pleural puncture	Ultrasound guidance; correct needle orientation; post-procedure monitoring
Supraclavicular / infraclavicular block	Pneumothorax	Excessive needle depth → pleural injury	Perform under ultrasound; observe after procedure
Thoracic paravertebral block	Pneumothorax	Needle penetration of parietal pleura	Use ultrasound or nerve stimulator guidance; proper positioning
	Ventilatory depression	Multiple intercostal levels → decreased chest wall compliance	Limit block extension; monitor respiration
Multiple intercostal nerve blocks	Systemic toxicity (LAST) → apnea	Rapid systemic absorption of local anesthetic	Fractionated dosing; aspiration before injection; monitor; intralipid ready
Peripheral nerve blocks (femoral, sciatic, TAP, etc.)	Rare: systemic toxicity (LAST)	Intravascular injection or overdose	Test aspiration; correct dose; close observation
All regional anesthesia techniques	Central respiratory depression (LAST)	Direct depressant effect on CNS and myocardium	Airway support; lipid emulsion (20% intralipid); advanced life support

DELIRIUM

SUDDEN, WAXING & WANING DECLINE in VARIOUS MENTAL FUNCTIONS

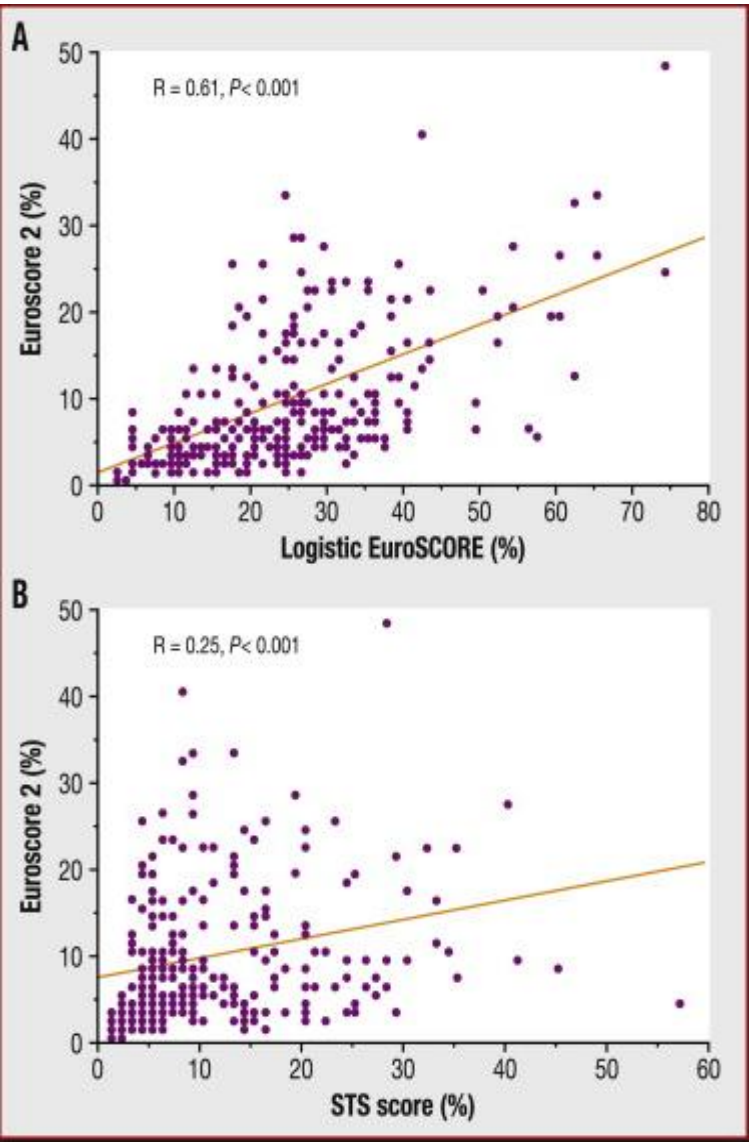
MEMORY

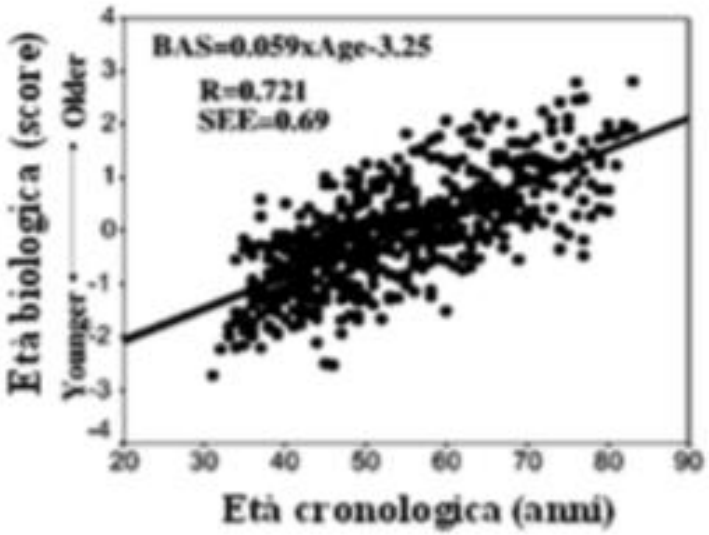
MOOD & PERSONALITY

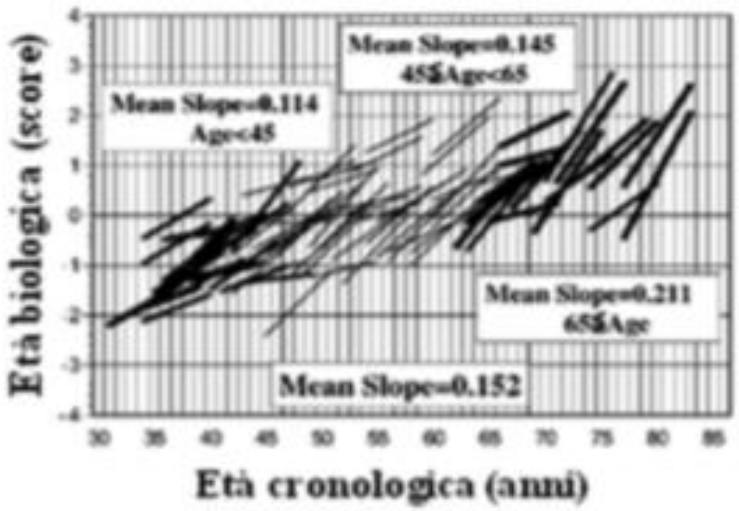
THINKING

LANGUAGE

BEHAVIOR



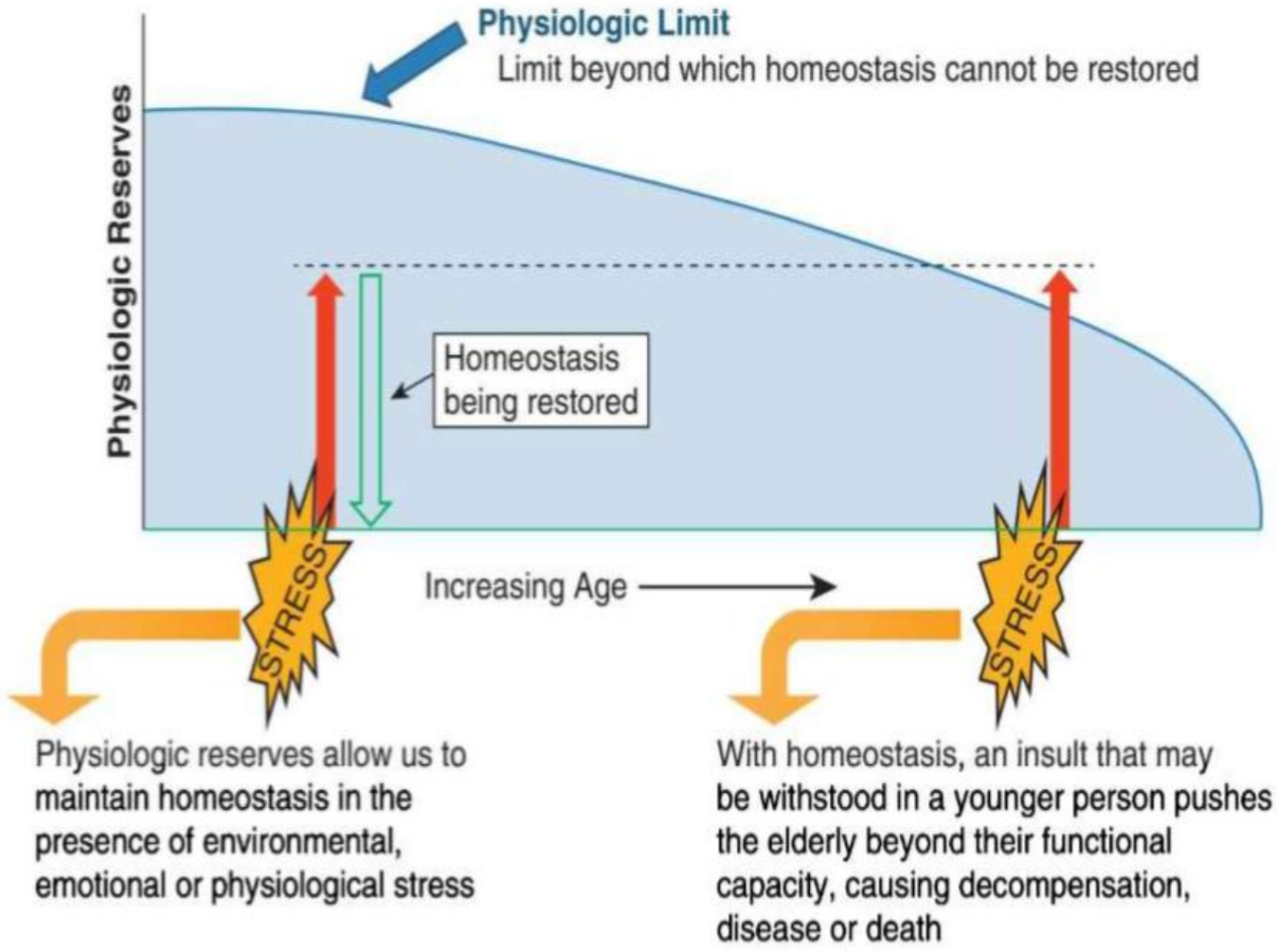




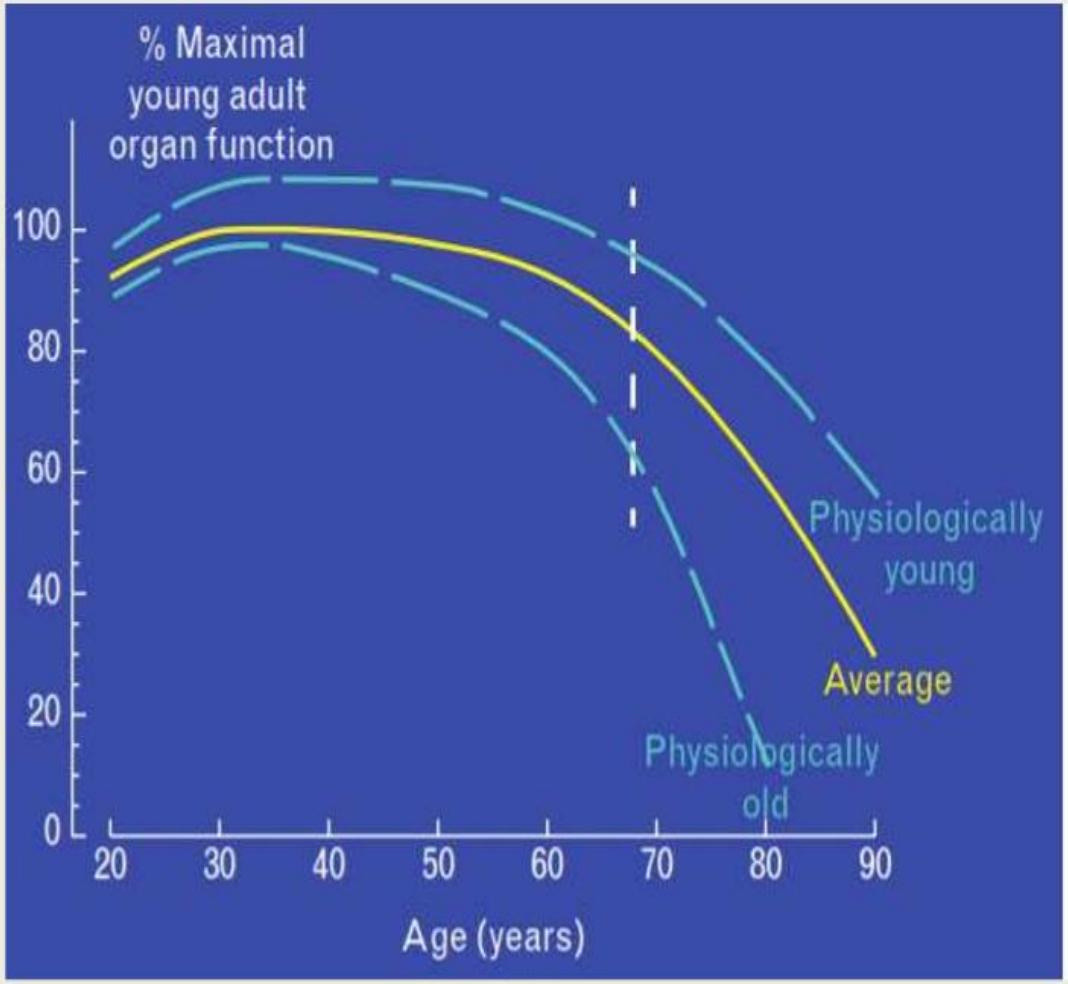
1. Età cronologica
2. Picco di capacità funzionale
3. Processo d'invecchiamento#

} I domini dell'età biologica

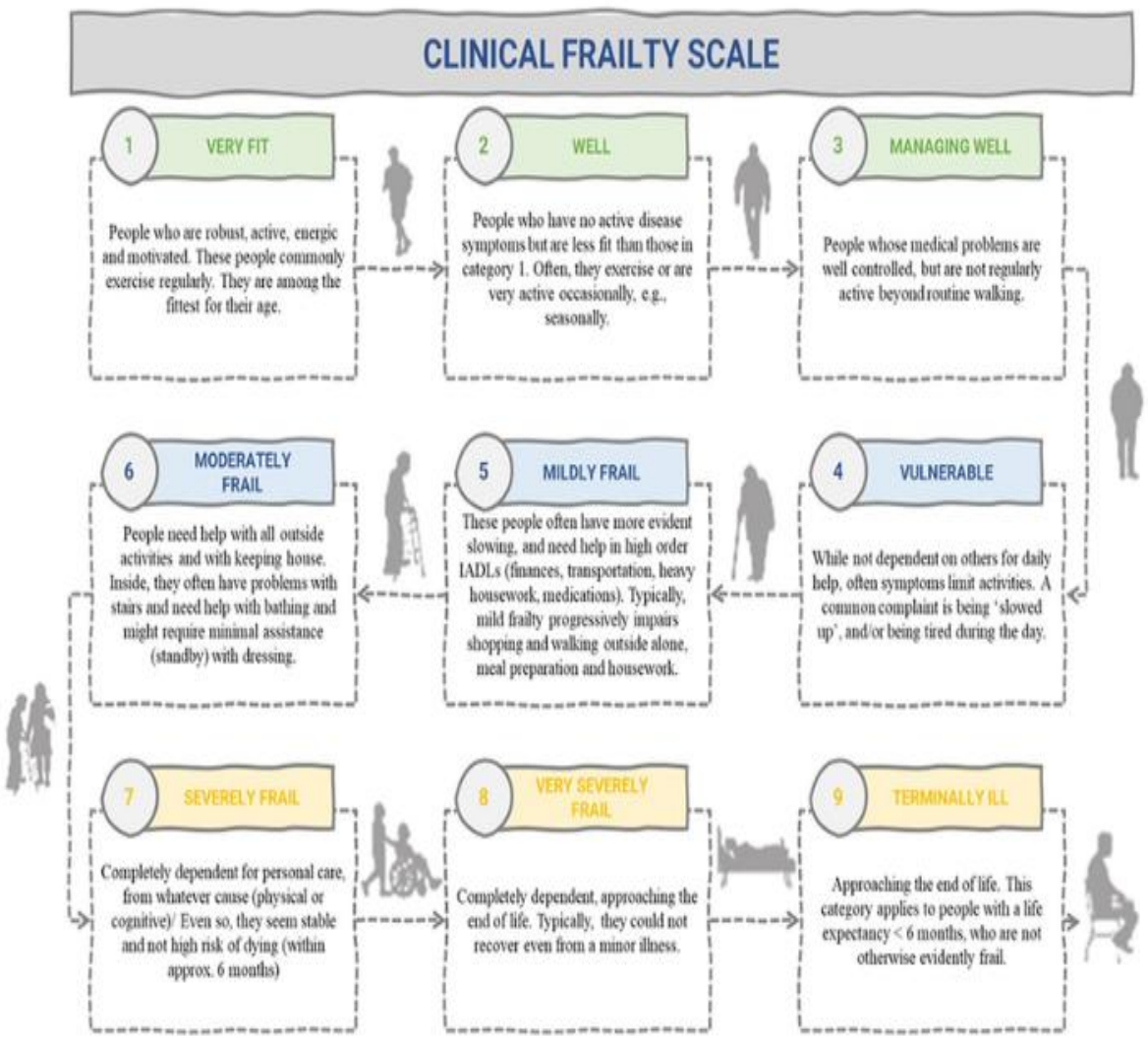
- Geneticamente determinato,
- # influenzato da stili di vita, fumo, esercizio fisico costante



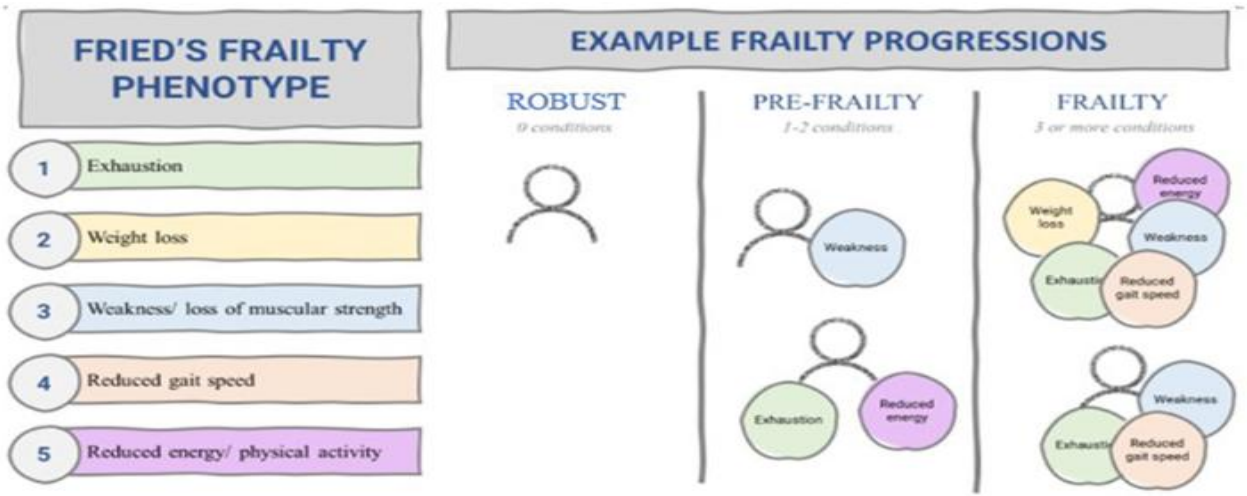
Da: **Perioperative Care of the Elderly.** G.Bettelli. Cambridge Med. 2018 pag 5



Age-related changes in major organ system function.

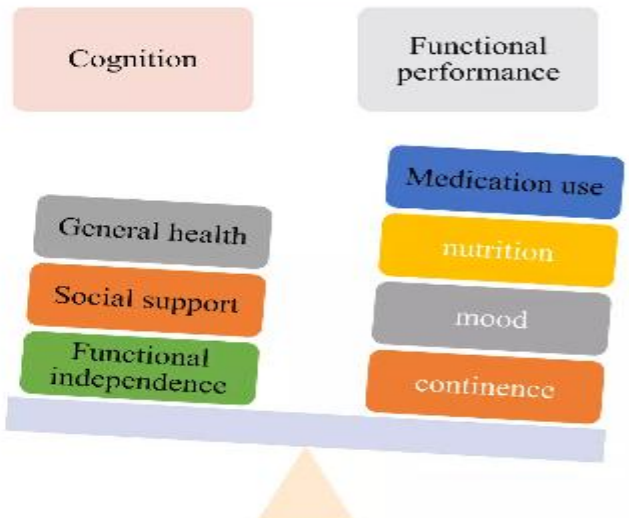


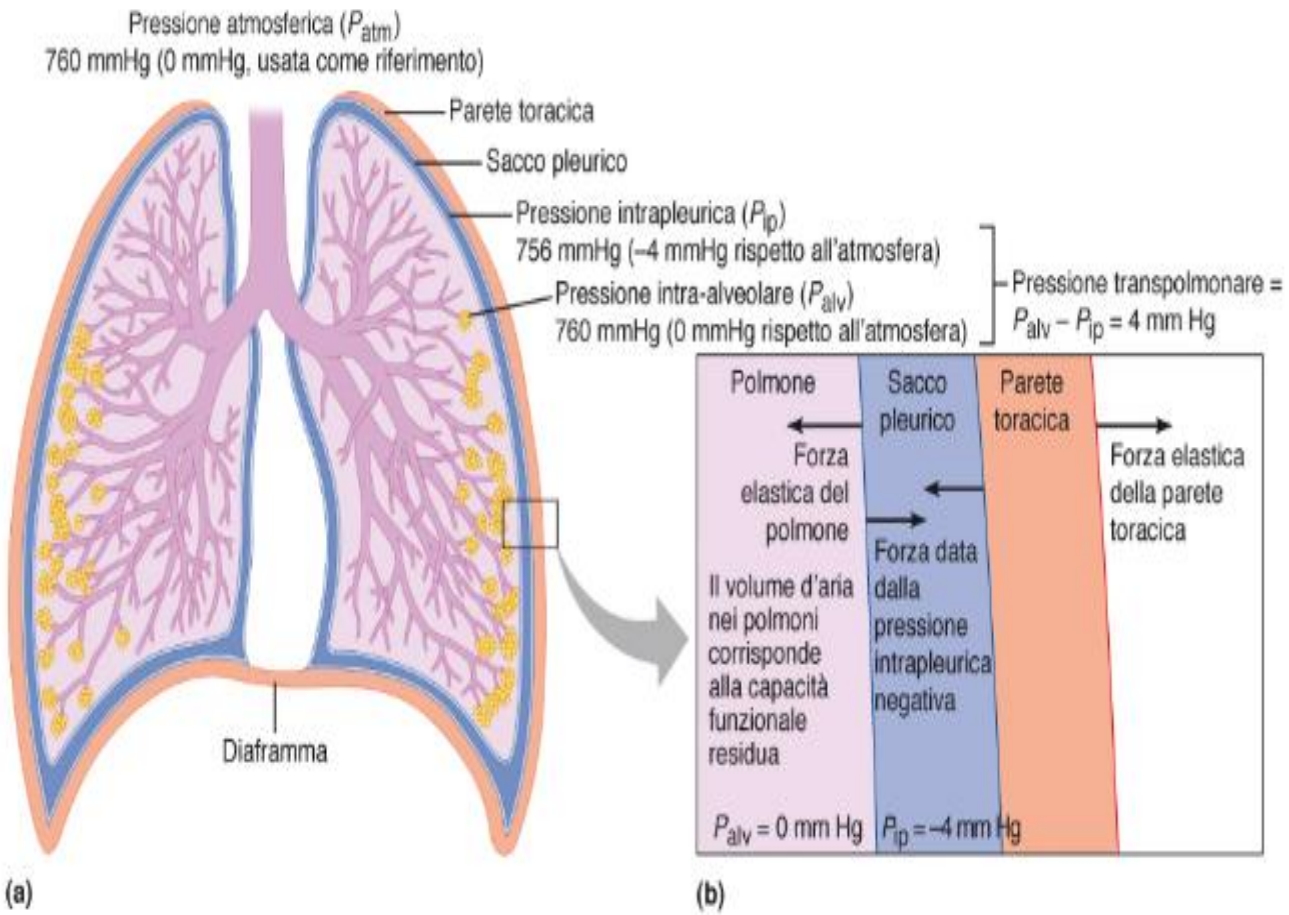
Clinical Frailty Scale (14).

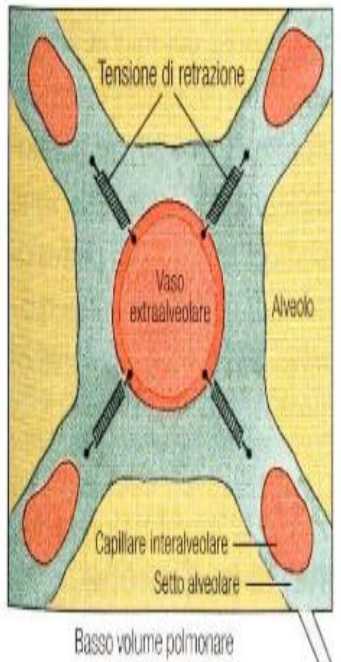


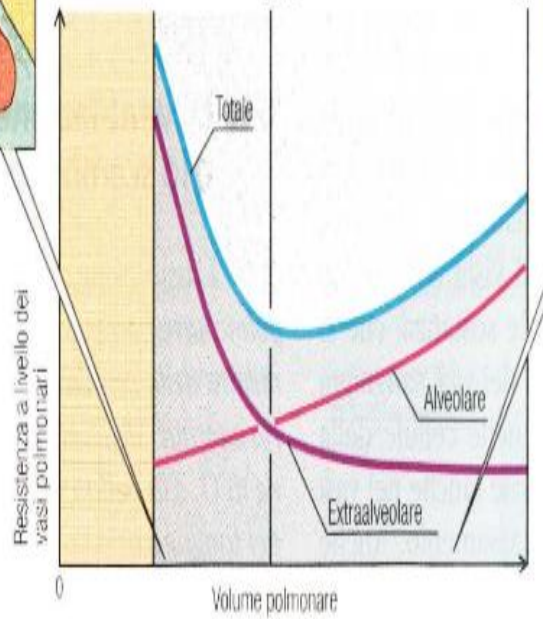
Fried's phenotype model of frailty (13).

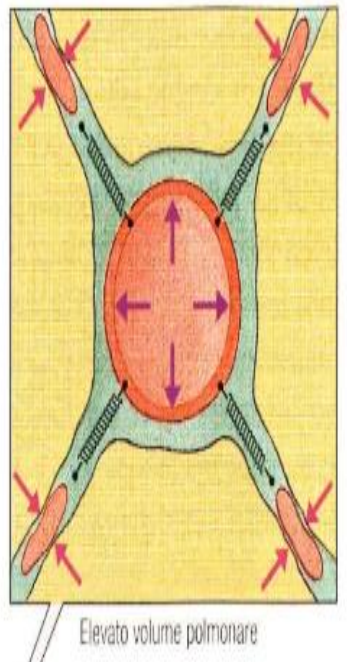
The Edmonton Frailty Scale (EFS)

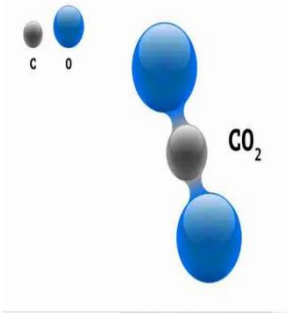












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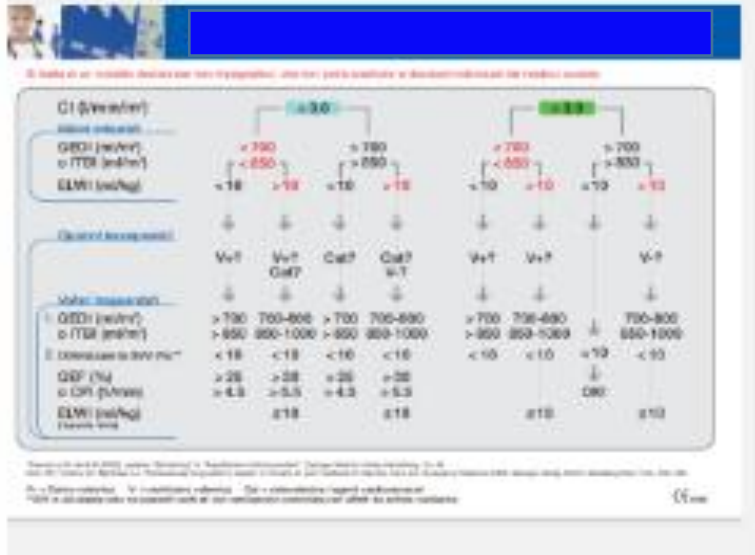
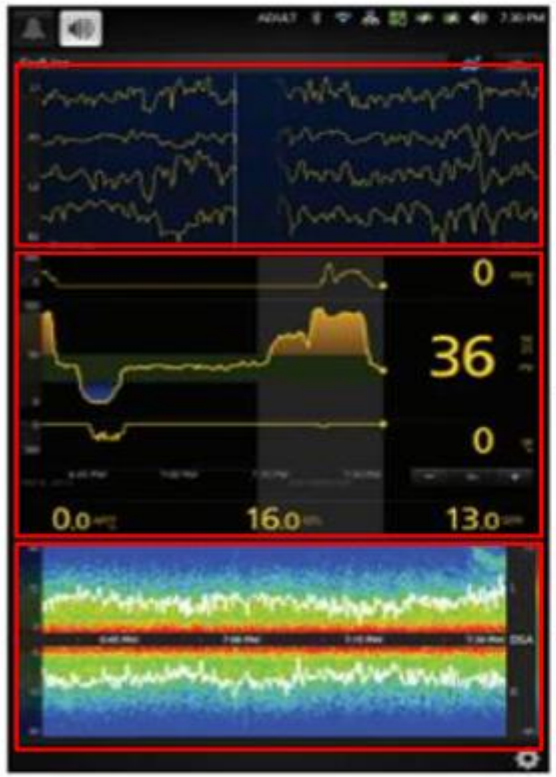
Acumen IQ sensor
HPI 57
CO
6.8
SVR
824
SVI
42
PR
68
SVV
10
PPV
15
CVP
CI
2.9
Ea dyn
1.4
dP/dt
508
SvO2
70
SVRI
1935
MAP
75

CO
4.1
SV
69
SVR
1288
SvO2
68

CO
4.6
SV
67
SVR
1400
SvO2
67
SVV
10
1.3
386
59


Indice cardiaco
Stroke volume indicizzato
Volume telediastolico globale indicizzato
Volume di sangue intratoracico indicizzato
Vol. acqua polmonare extravascolare indic.
Permeabilità vascolare polmonare indicizzata
Variazioni di stroke volume
Variazione della pressione pulsatoria
Frazione d'eiezione globale
Indice di funzionalità cardiaca
Pressione arteriosa media
Resistenze vascolari sistemiche indicizzate
PULSION
Medical Systems

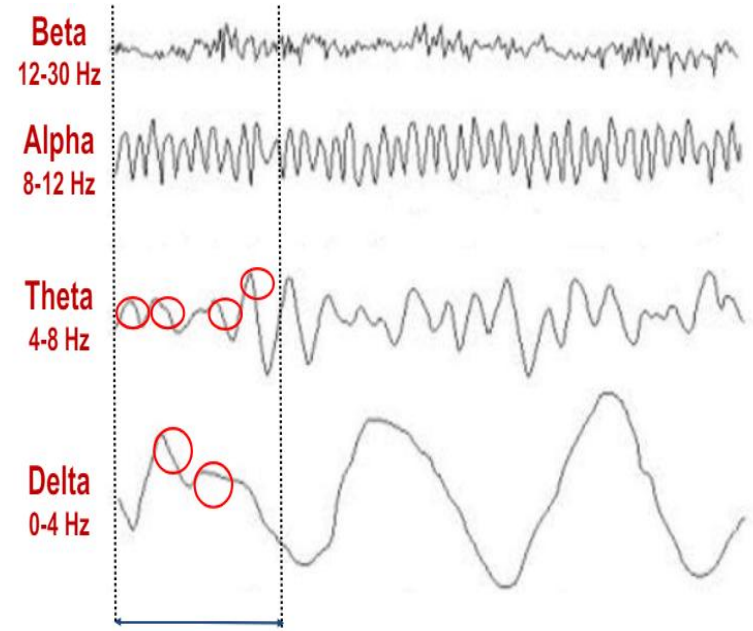




Recommendations for standards of monitoring during anaesthesia and recovery 2021

7 Processed electroencephalogram (pEEG) monitoring

Anaesthetists should not rely solely on index values displayed by pEEG monitors. Rather, they should develop a basic understanding of EEG waveforms and the interpretation of information from power spectral analysis, density spectral array ('spectrograms') and relative band powers.

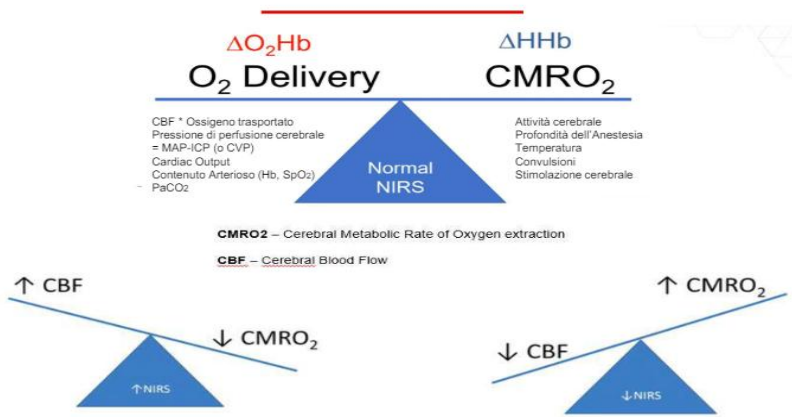


Randomized Controlled Trial > Br J Anaesth. 2014 Dec;113(6):1001-8. doi: 10.1093/bja/aeu105. Epub 2014 May 22.

Association between intraoperative electroencephalographic suppression and postoperative mortality

M Willingham [1], A Ben Abdallah [1], S Gradwohl [1], D Helsten [1], N Lin [2], A Villafranca [3], E Jacobsohn [3], M Avidan [1], H Kaiser [4]

Conclusions: Although EEG suppression was associated with increasing anaesthetic administration and comorbidities, the hypothesis that intraoperative EEG suppression is a predictor of postoperative mortality was only supported if it was coincident with low MAP.



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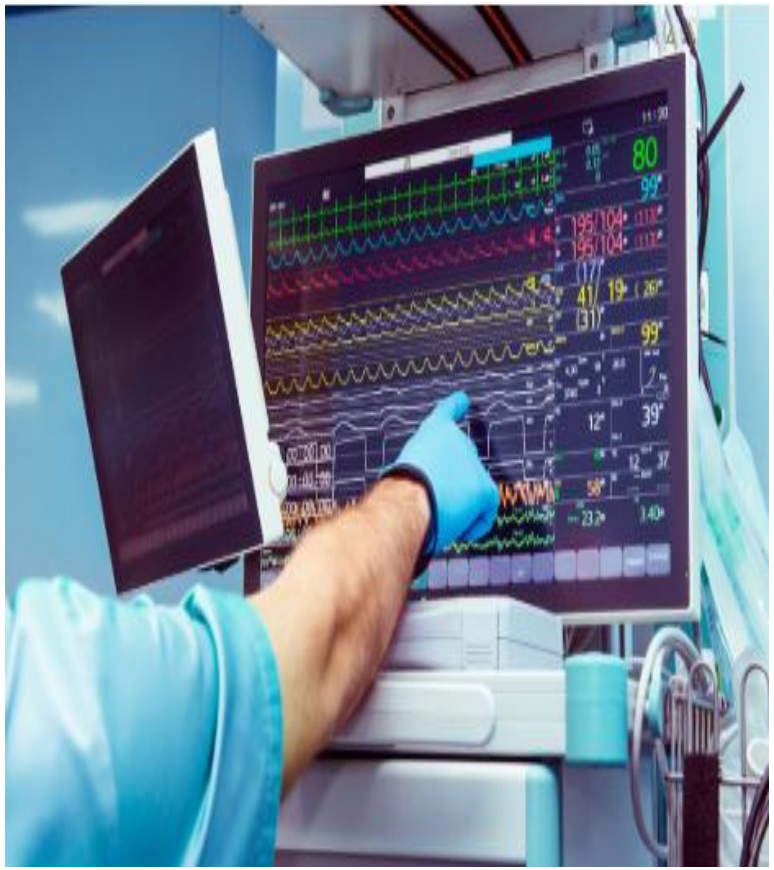
NEUROCRITICAL CARE SOCIETY

ORIGINAL WORK

Processed Electroencephalogram-Based Monitoring to Guide Sedation in Critically Ill Adult Patients: Recommendations from an International Expert Panel-Based Consensus

Frank A. Rasulo[1,2*], Philip Hopkins[3], Francisco A. Lobo[4], Pierre Pandin[5], Basil Matta[6], Carla Carozzi[7], Stefano Romagnoli[8], Anthony Absalom[9], Rafael Badenes[10], Thomas Bleck[11], Anselmo Caricato[12], Jan Claassen[13], André Denault[14], Cristina Honorato[15], Saba Motta[16], Geert Meyfroidt[17], Finn Michael Radtke[18], Zaccaria Ricci[19], Chiara Robba[20], Fabio S. Taccone[5], Paul Vespa[21], Ida Nardiello[1] and Massimo Lamperti[4]


don't worry
this will only hurt
if you wake up



GRAZIE!